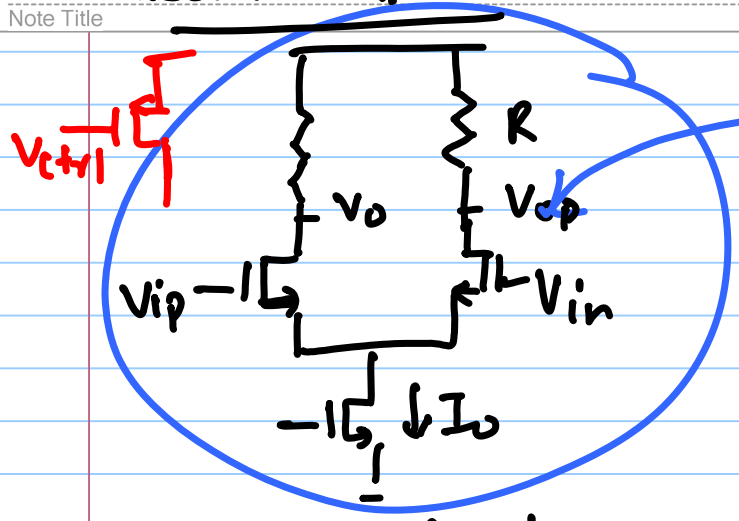
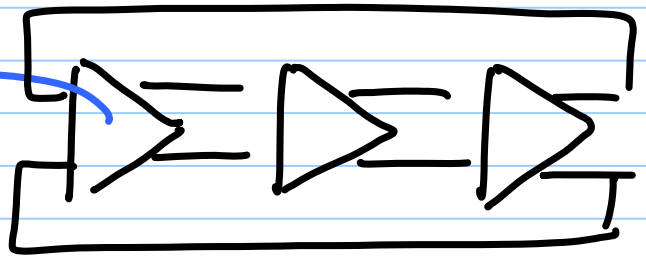
Lecture #33

Note Title 05-10-2017





$$I = \frac{kW}{L}\left((V_{SG} - |V_{TP}|)\,V_{SD} - \frac{V_{SD}^2}{2}\right)$$

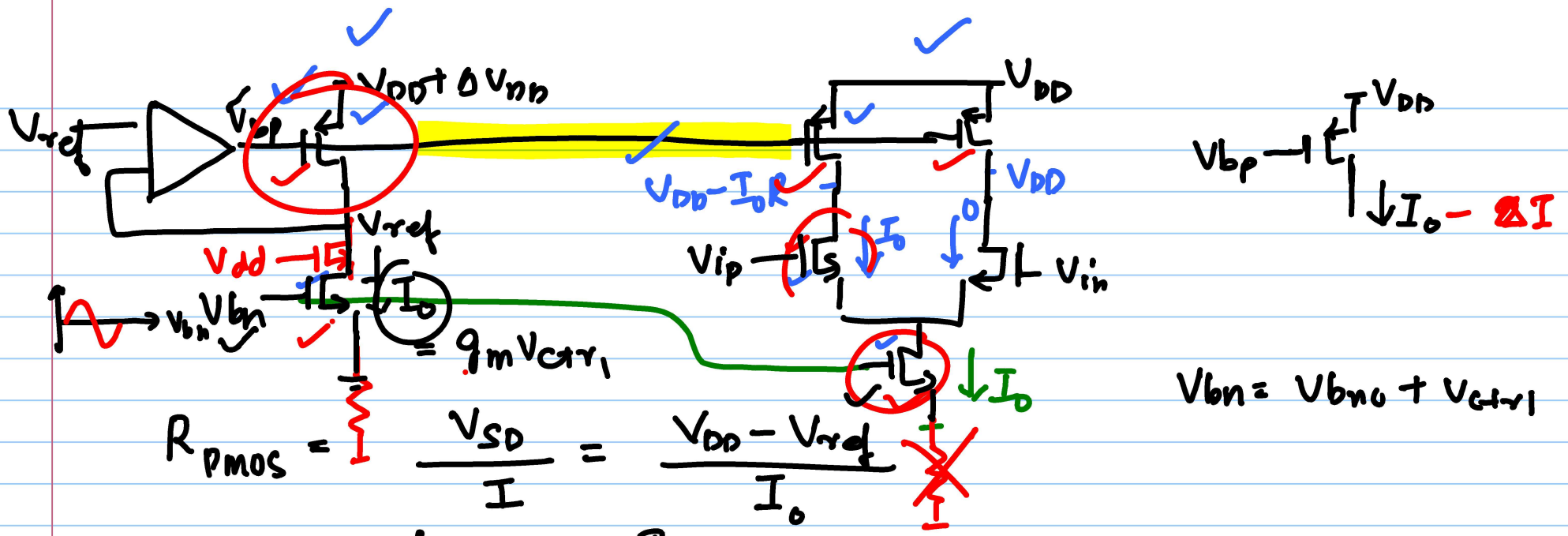
$$f_{osc} \propto \frac{1}{RC}$$

$$R \approx \frac{V_{SD}}{I} = \frac{1}{\frac{kW}{L}(V_{SG} - |V_{TP}|)}$$

$$f_{osc} \propto -V_{ctrl}$$

$$V_{out} = I_o R \propto \frac{1}{f_{osc}}$$

$$I_o \propto \frac{1}{R}$$



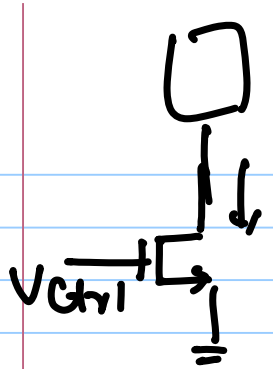
$$R_{PMOS} = \frac{V_{SD}}{I} = \frac{V_{DD}-V_{ref}}{I_0}$$

$$V_{bn} = V_{bn0} + V_{ctrl}$$

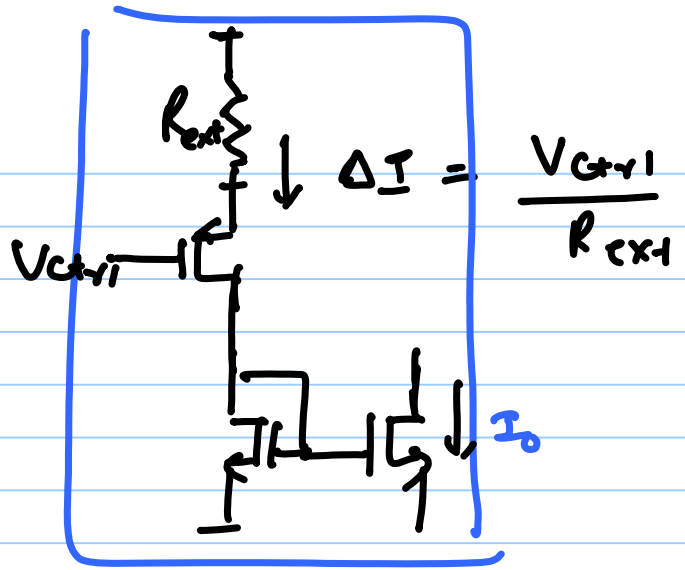
$$f_{osc} \propto \frac{1}{R} = \frac{I_0}{V_{DD}-V_{ref}} = \frac{g_m V_{ctrl}}{V_{DD}-V_{ref}}.$$

$$V_{out} = I_0 R = \frac{V_{DD}-V_{ref}}{I_0} \cdot I_0 = V_{DD}-V_{ref}$$

$$\Delta I = g_m V_{ctrl}$$

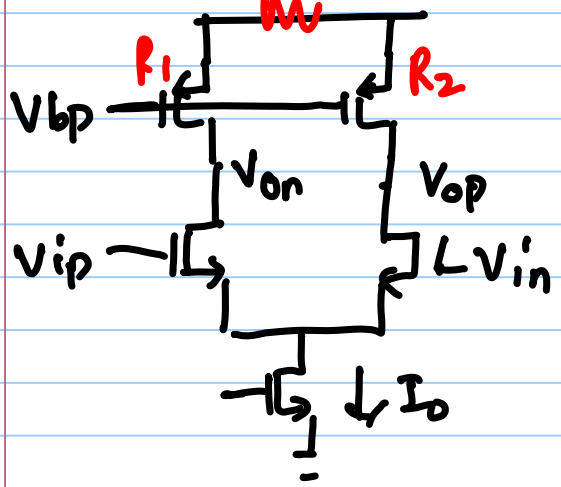


$\Delta I = g_m V_{Ctrl}$



$\Delta I = \frac{V_{Ctrl}}{R_{ext}}$

Power Supply Noise Rejection

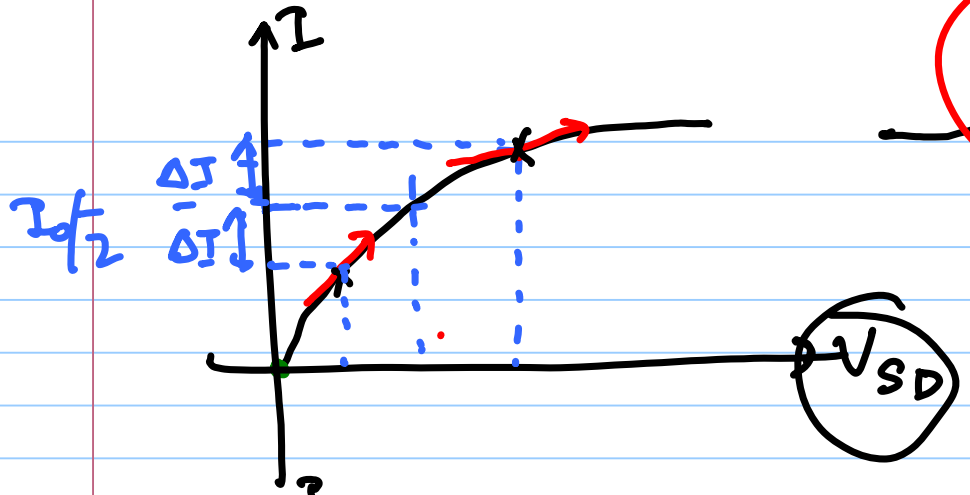


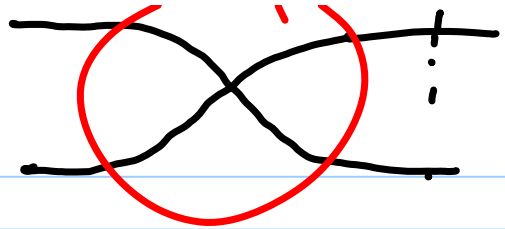
$$V_{op} = V_{DD} - \left(\frac{I_o}{2} - \Delta I\right) R_2$$

$$V_{on} = V_{DD} - \left(\frac{I_o}{2} + \Delta I\right) R_1$$

$$V_{op} = (V_{DD} + \Delta V_{DD}) - \left(\frac{I_o}{2}\right) R_2 \quad (I, \checkmark V)$$

$$V_{on} = (V_{DD} + \Delta V_{DD}) - \left(\frac{I_o}{2}\right) R_1 \quad (I, \checkmark V)$$





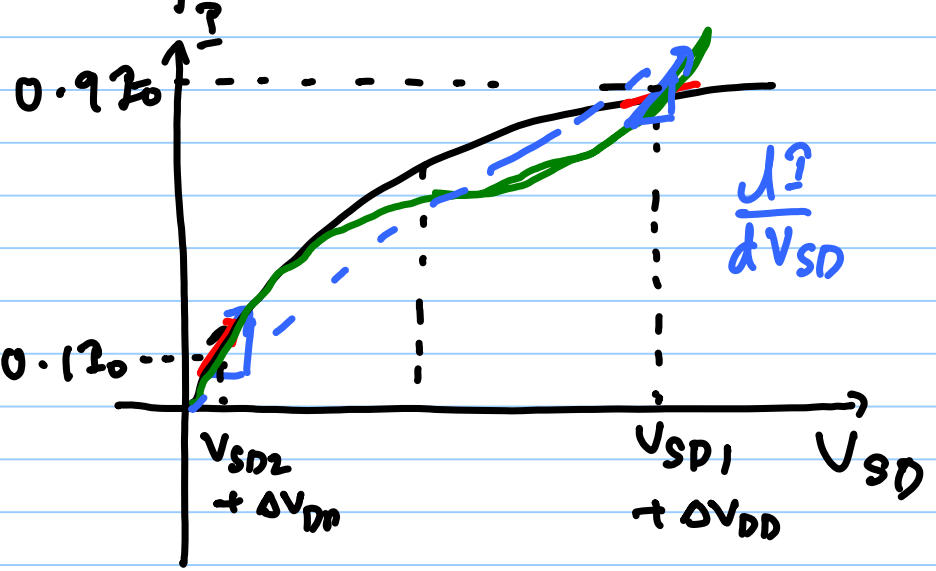
$V_{op} = V_{DD}$

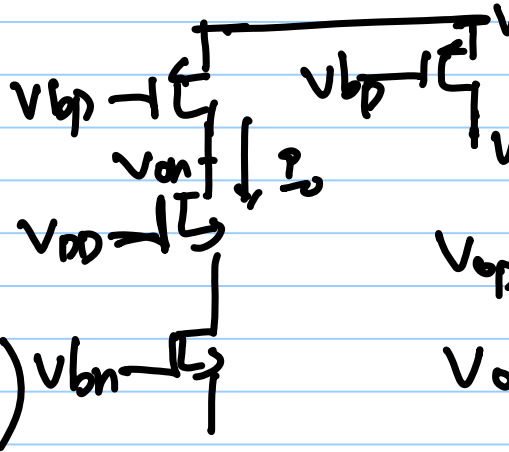
$V_{on} = V_{DD} - I_0 R$

$$V_{op} = (V_{DD} + \Delta V_{DD}) - \left(\frac{I_0}{2} - \Delta I\right) R\left(\frac{I_0}{2} - \Delta I,\ V_{DD} + \Delta V_{DD} - V_{op}\right)$$

$$V_{on} = (V_{DD} + \Delta V_{DD}) - \left(\frac{I_0}{2} + \Delta I\right) R(I, V_{SD})$$

$$V_{op} - V_{on} = \Delta I \left[R(I_1, V_{SD1}) - R(I_2, V_{SD2})\right]$$

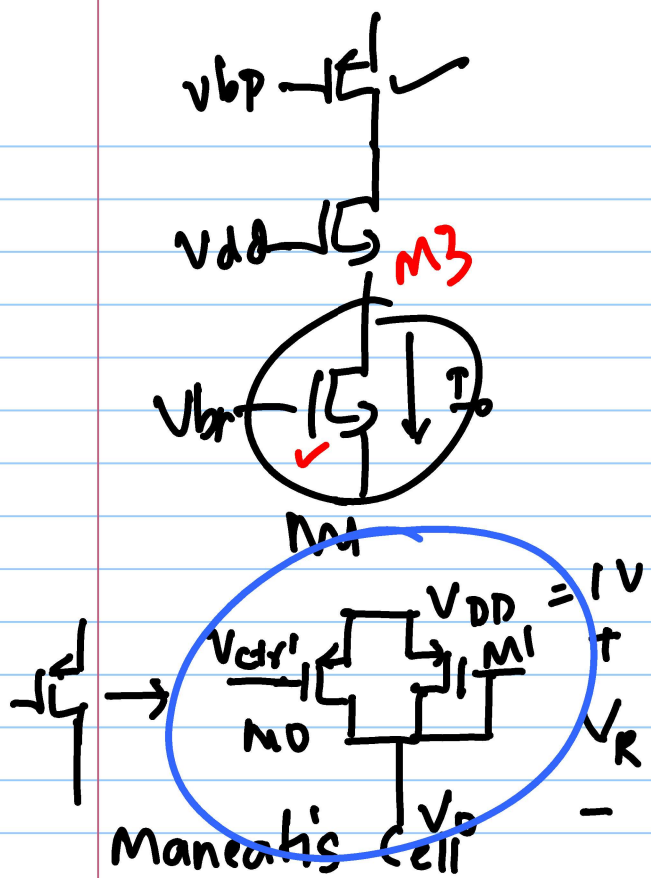




$$I = \frac{KW}{L}\left((V_{DD} - V_{bp} - |V_{TP}|)V_{SD} - \frac{V_{SD}^2}{2}\right)$$

$$V_{op} = V_{DD} + \Delta V_{DD}$$

$$V_{on} = V_{DD} - I_0 . R(\quad) + \Delta V_{DD}$$



$V_R = 0$, $V_O = V_{DD}$

$V_R = 10mV$, $V_O = 0.99V$